UKRAINE
NATIONAL ELECTRICITY REGULATORY COMMISSION

INVESTOR'S GUIDE TO THE MARKET FUNDS AND SYSTEMS SETTLEMENT PROCEDURES

Energy IQC Task Order for Ukraine
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Final Report

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CHAPTER 1
INTRODUCTION

1.1 OVERVIEW

This report addresses the topic of making data from the Ukrainian Wholesale Electricity Market's Systems Settlements and Market Funds Procedures more comprehensible and accessible to potential investors in the power sector of Ukraine. It describes the data files, information available in these files and the workings of these procedures and offers information that might be potentially of interest to investors. This report is a deliverable under the Energy IQC Task Order for Ukraine, Contract No. LAG-I-00-98-00005, Task Order 803. Task A (10) reads as follows:

"Establish a mechanism to make Energomarket/Market Funds Procedures data and analysis available to prospective investors"

Deliverable number 7 related to this task reads as follows:

"Draft format of Energomarket/Market Funds Procedures data and analysis for investors"

1.2 SUMMARY OF WORK

The operation of a wholesale market for electricity within the restructured electricity sector in Ukraine has required the development of appropriate software in order to account for sales, purchases and price setting within the Market. Such a system of software is continuing to be refined, in order to account for increasing numbers of Independent Electricity Suppliers (IESs) and to leave a generally understandable historical record of the market operations. Such data is compiled daily, reflecting hourly and daily market conditions and forms the basis of the systems settlement of the Wholesale Market for Electricity, where:

< The Wholesale Purchase Price is set according to the bidding parameters of the fossil-thermal Generator blocks and paid to the thermal generation,

- Administrative tariffs are paid to Nuclear, Hydro, Combined Heat and Power and imported generation sales to the market,

- Transmission losses, subsidy certificates and other uplift components are incorporated with generation costs to calculate the hourly Wholesale Market Price

- Hourly consumption of Oblenergos and IESs is recorded at the hourly Wholesale Market Price. Independent Suppliers are actually charged the hourly price while oblenergos are charged an administratively determined price.

The data generated from the Systems Settlement process is further passed on to the Market Funds Administrator. Utilizing a cash allocation algorithm and system settlement data, the Market Funds Administrator determines the distribution of the total cash collected from electricity customers amongst the different market participants. The determination of this process also requires appropriate software, which is run on a daily or semi-daily basis.

The existence and regular generation of these data files from the Energomarket can provide a wealth of information on the workings of the wholesale market as well as operating and financial characteristics of the market participants: oblenergos, generators, independent suppliers, CHPs, and the National Dispatch Center. Data files collected from these processes can provide a level of transparency regarding market operations and with thorough analysis can be of great use to those looking for potential investment opportunities. Hourly and daily information on systems settlements and the data from the Market Funds Procedure can provide a basis for the compilation of physical and financial indicators regarding the relative attractiveness of Oblenergos and Gencos to be privatized.

However, the Energomarket is still largely opaque. NERC and the Systems Settlements Administrator (SSA) routinely violate the Market Rules. The SSA regularly ignores various relatively minor components of the market rules, such as the constrained on and off payments and block failure penalties. NERC does not allow the price charged oblenergos or the price paid to the Gencos to be determined by the market rules, setting their wholesale prices administratively on a non-transparent basis. While NERC did allow the Gencos to be paid according the Market Rules from April to October 1998, beginning in November 1998, NERC again began to set the Genco wholesale prices. In addition, NERC regularly adjusts and sets key components of the Market Funds Procedure algorithm on a seemingly arbitrary basis.

Detailed market data is commonly made available by Wholesale Market Pools of other countries in the world, and in several it can be accessed through sites on the World Wide Web. With such data, both current and potential market participants can better understand the operation of the market, assess their own positions and plan strategically. Such a wealth of information might prompt strategic investors to better gauge their investment opportunities, better assess the risks and return involved, and more

strongly consider actual investment in the Ukrainian power sector. However, to repeat, many of the variables determining the results of the Wholesale Electricity Market operation continue to be adjusted or set by NERC on an arbitrary basis and thus significantly increasing the risks of investment.

Some of the regularly produced Wholesale Market data from the procdures can be directly related to particular companies' financial parameters. For instance, the cash allocation resulting from the Market Funds Procedure provides information on the source and volumes of the cash flow from the Energomarket to the generating companies. This cash flow directly affects the Genco ability to conduct their business operations such as buying fuel, paying salaries, undertaking maintenance, capital renovation, considering new investment, etc. Other information, such as the daily bids submitted to the Energomarket by the different generators can serve as the basis for more complex market analysis and understanding of the process of the setting of the Wholesale Purchase Price for electricity (which all of the Genco fossil generators are to be subsequently paid). Information on the load curves of Oblenergos, as well as their current cash collection rates and receipt of cash from the market can also serve as key investment indicators.

This report discusses these two processes: *Systems Settlement* and *the Market Funds Procedure*, and the data files in which they are captured. From these large available volumes of data, information of particular potential interest to investors can potentially be compiled and sets of indicators developed and presented in standard formats.

The first section of the report will address Systems Settlement data, with a brief overview of what data can be found there and how it is compiled into data files. Potential data of interest regarding Gencos, Oblenergos, Nuclear, Hydro, CHPs as well the price setting processes will be presented and discussed. The second section of the report will deal with the Market Funds Procedure and will begin with a description of its development, history, current status and data format. As with the Systems Settlements data, information of potential interest to investors - particularly regarding cash flows between Oblenergos, the Energomarket and Gencos - will be presented and discussed.

With the identification of such relevant market parameters, elements of the regular data produced in the course of Energomarket operation could be made available for utilization by an audience of investors. The format for regular reporting of the parameters developed in this report could provide a basis for a more complete understanding of key characteristics of the companies participating in the Wholesale Electricity Market and of the market environment as a whole by potential investors.

1.3 KEY TERMS

CHP	Combined Heat and Power plant (a.k.a. TEZ)
Energomarket	Wholesale Electricity Market
Genco	Fossil Generating Company
IES	Independent Electricity Supplier
LEC	Regulated Electricity Supplier, (a.k.a. Oblenergo)
MFP	Market Funds Procudure
Minenergo	Ministry of Fuel and Energy
NDC	National Dispatch Center
NERC	National Electricity Regulatory Commission
Oblenergo	Regulated Electricity Supplier
SSA	Systems Settlement Administration

CHAPTER 2
DESCRIPTION OF THE SYSTEMS SETTLEMENTS PROCEDURE

2.1 GENERAL

The Systems Settlement Administrator (SSA) is an integral part of the Energomarket, which is currently part of the state-owned company Ukrenergo. It is within the SSA that the Wholesale Purchase Price is determined on the basis of thermal Genco bids, that hourly generation is attributed to all generators and payments due to the different generation entities are calculated. (However currently, Genco prices are set by NERC so payments do not equal the SSA-determined amounts). Additionally, by incorporating high voltage transmission losses, subsidy certificates, and other uplift components, the Systems Settlement Administrator determines the hourly Wholesale Market Price faced by electricity suppliers. (Oblenergos, Independent Energy Suppliers) Finally, the hourly payments due from the suppliers are calculated.

The software to perform these detailed calculations has been running for over two years, and files in Excel are generated each day recording this process. There are six files in particular, which provide a great deal of information on the daily workings of the market.

Cnddmm.xls
Dnddmm.xls
Dbddmm.xls
Zdddmm.xls
Ctddmm.xls
Obddmm.xls

The first four files (cn, dn, db, zd) contain information on the four fossil/thermal Gencos: Centerenergo, Dniproenergo, Donbassenergo, and Zakhidenergo. The numbers following the letters in the file name indicate the day of operation described in the data; for example, cn0102.xls would be for February 1.

Data included in these files include:

- Genco individual blocks' hourly maximum and minimum availability,
- Genco Block Flexibility
- Scheduled generation, instructed generation, actual and actual adjusted generation
- Block failure, Constrained on and off, Payments
- System Marginal Price, Availability Price and Wholesale Purchase Price
- Blocks' bids (consisting of Start Up cost, No-load Fee and prices and quantities at four elbow points) are also recorded, allowing insight into Genco's blocks possible costs, bidding approach and the blocks setting the marginal price.

The "ct" file describes the generation and payment due to the generators operating according to bilateral contracts with the Energomarket. These include Energoatom, the Hydro companies (Dniprohydroenergo and Dniesterhydroenergo), CHPs not affiliated with Oblenergos, and interconnectors (exports and imports).

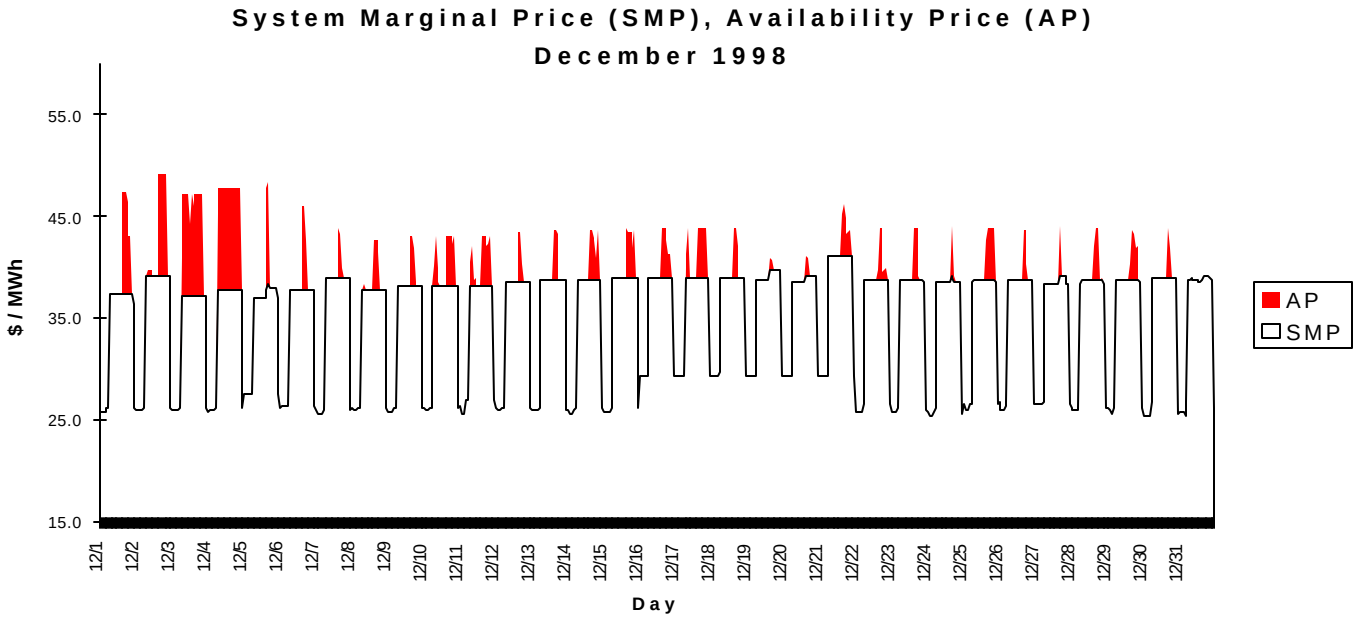
Within the "ob" file the generation information is consolidated, and the hourly Wholesale Market Price is determined, by incorporating high voltage transmission losses, subsidy certificates, and other uplift components. Hourly consumption by the Oblenergos and the IESs is noted and the hourly payments due by the suppliers are calculated. The oblenergos tariffs as established by NERC are also included and a balancing of the market (so that payments due to generators equal payment collected from suppliers) is done.

2.2 REGULAR REPORTS / INDICATORS OF INTEREST

2.2.1 Prices – Hourly SMP / AP / WPP / WMP

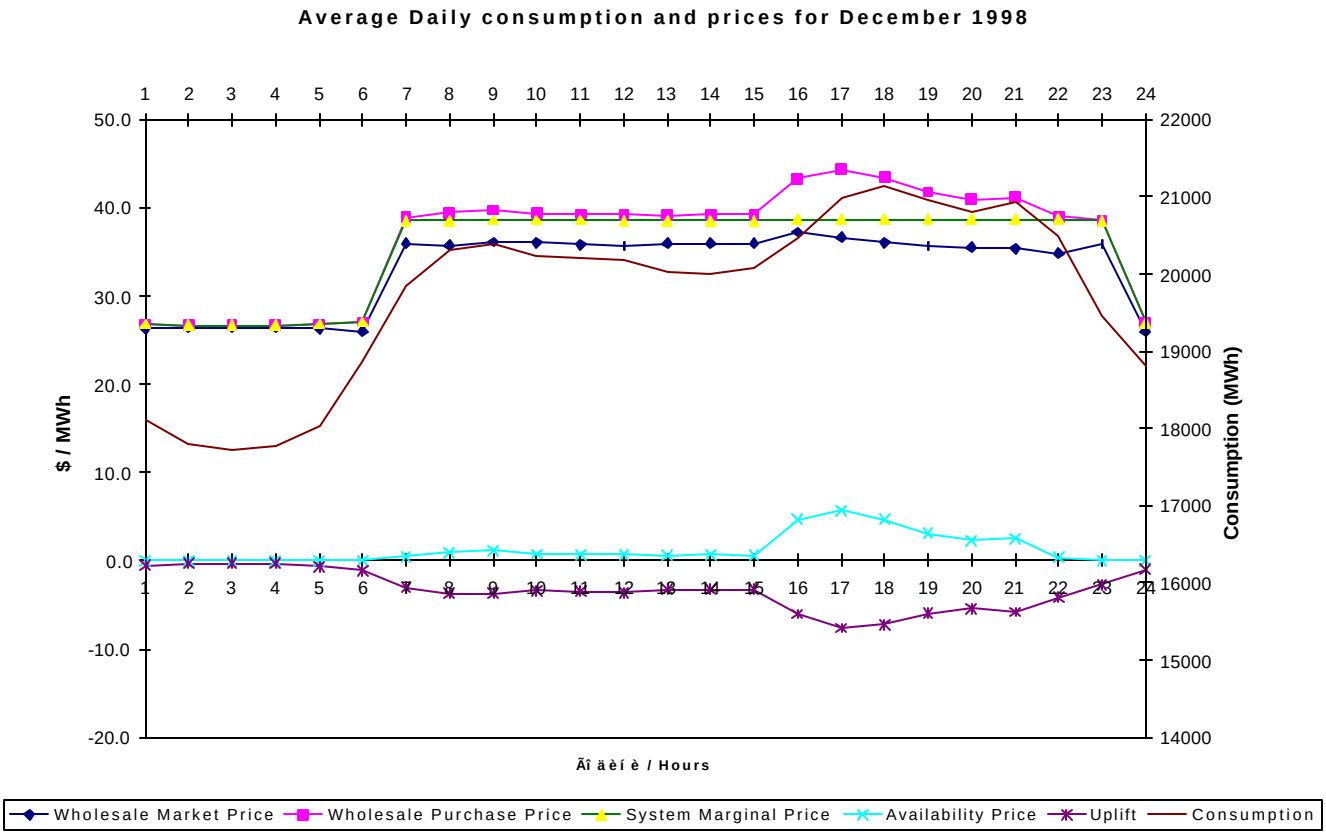
One of the most obvious indicators on the operation of the market is the hourly Wholesale Purchase Price (the price that should be paid to the fossil/thermal generators) which is comprised of the System Marginal Price and an Availability Price. The SMP is set as the price of the marginal flexible block needed to satisfy the overall system demand. (The blocks are ranked by the bids submitted by the generators. Analyzing the bids to understand how this price is formed represents a potential additional layer of analytical complexity). The AP, on the other hand, comes into effect whenever the margin of reserve capacity falls beneath an established limit, and is designed to compensate available capacity for helping prevent the loss of load to customers. These two prices are calculated on an hourly basis and are added together to form the Wholesale Purchase Price.

The WPP multiplied by the hourly generation determines the hourly payments due to a Genco for its produced electricity. Compiling and analyzing historical data on these prices in the market can prove very useful for potential investors in Generators in assessing trends and price volatility, determining their potential levels of price risk, and helping decide on appropriate contracts to mitigate such risks. As IESs (with oblenergos to follow soon) pay the Wholesale Market Price for the electricity they purchase (of which the WPP is the primary component) such analysis would also be of interest to potential investors in electricity distribution companies. Included is a table of the SMP and AP for the month of December, as an example.



Here it can be seen that the price during the night time hours stayed between $25 and $30 per Mwh, while the price for hours 6-23 generally ranged from $37-$39 per Mwh. On December 21st the SMP rose above $41/Mwh, which is above the old bid cap limit that was removed in September. Under NERC's December 4th Resolution #1598, the fixed costs factor used in calculating the Availability Price for capacity was lowered from $10 to $5 per MW effective December 7th. As the Availability Price is generally paid out in a relatively large number of hours during winter months due to the general lack of available capacity, this Resolution served to lower the average WPP paid to thermal generators. Thus the average WPP per Mwh sold by the Gencos in December was $36.7 (weighted by consumption), down from $37.3 as calculated using the old Availability Price. *In total, this Resolution would have translated into $4.6 million less revenues for the four thermal gencos.*

Below is a graph for the month of December showing the average monthly prices resulting from the Wholesale Market for each hour. While the WPP represents the price that should be paid to generators, the WMP represents the price that should be charged to electricity suppliers.



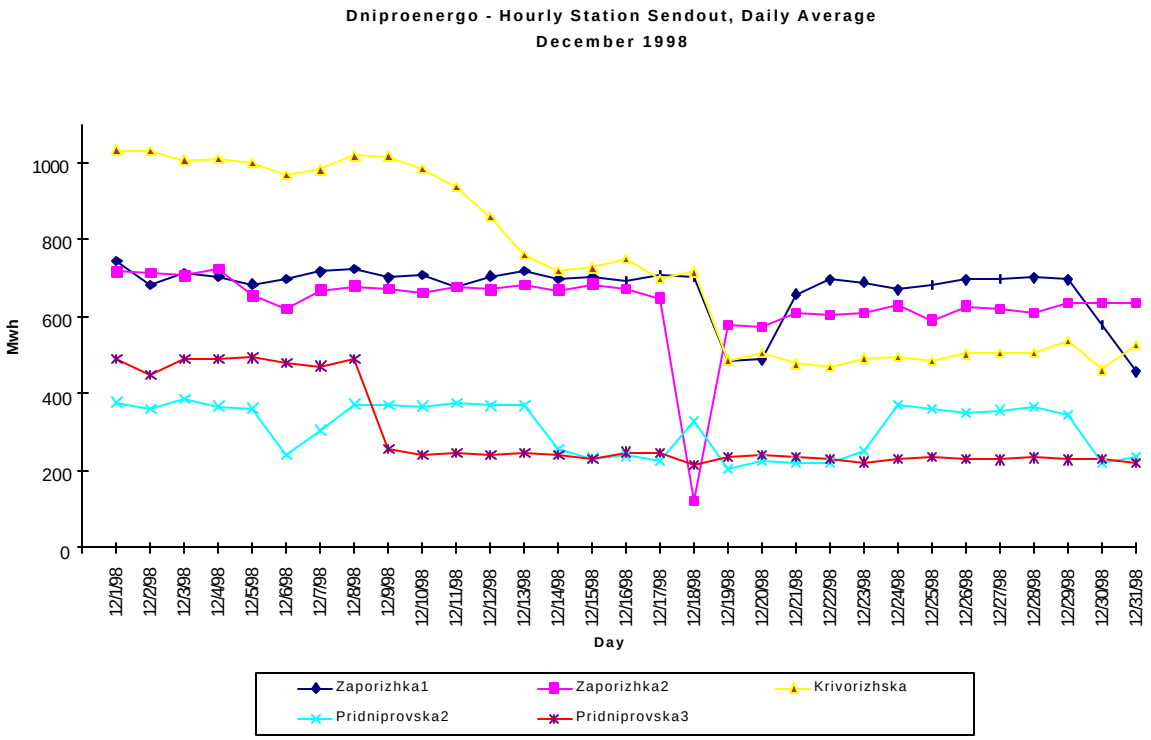
This graph highlights a current problem with the Wholesale Market Rules. It constructs the hourly Wholesale Purchase Price (WPP) that should be paid to thermal generating companies and the hourly Wholesale Market Price (WMP) paid by IESs and shows hourly consumption. The WPP to be paid to thermal generating companies is the sum of the System Marginal Price and the Availability Price; the Availability Price is positive in only some hours and therefore the WPP in other hours is identical to the System Marginal Price. The WMP is the sum of the WPP and Uplift. Uplift consists of (1) the per-MWh value of the difference between the WPP and the price paid to the nuclear and hydroelectric generators, (2) the per-MWh price paid to NDC and Ukrelectroperedacha, and (3) other items such as subsidy certificates. Note that in most hours the uplift is negative, and that it becomes most negative when the Availability Price is positive. The reason for this surge is that the output of the hydroelectric plants increases dramatically during peak hours in order to accommodate peak demand, and the price paid to hydroelectric plants is far below the WPP paid to thermal generating companies. The problem is that, as shown by the graph of the WMP, the price charged to independent suppliers is extremely flat

over the day; there is little price signal (for customers with time-of-use meters) to reduce consumption during peak hours.

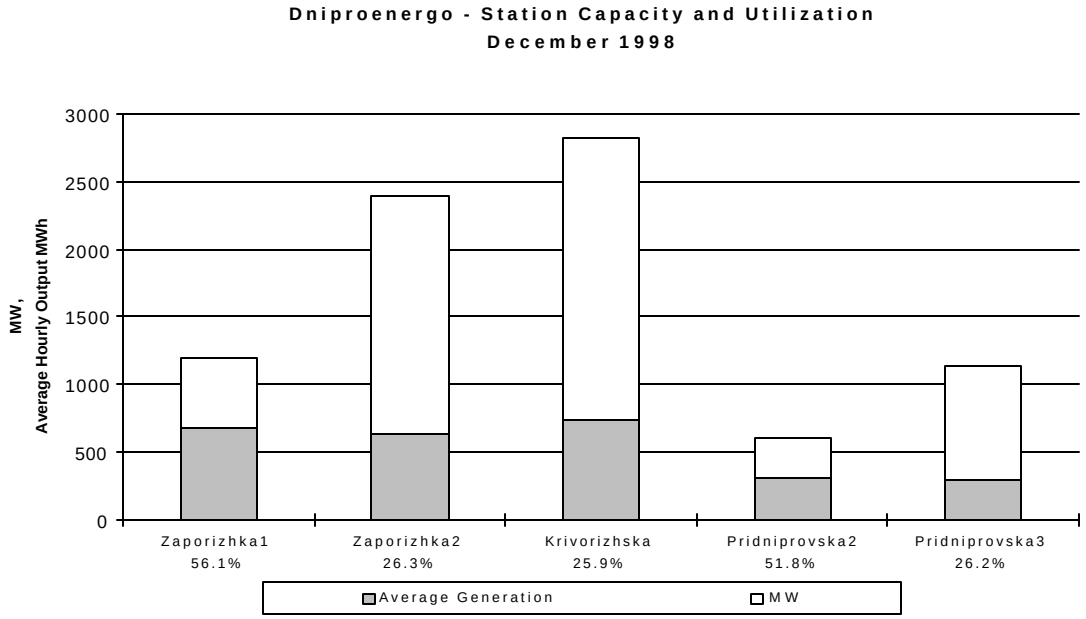
2.2.2 Generation

Another obvious set of indicators pertaining to specific generators is their level of generation, and the generation of their particular plants. It is after all on the basis of this generation that they are paid.

Offered below as an example, is a graph of Dniproenergo hourly station sendout for the month of December, showing the average hourly generation of the different station blocks for each day.

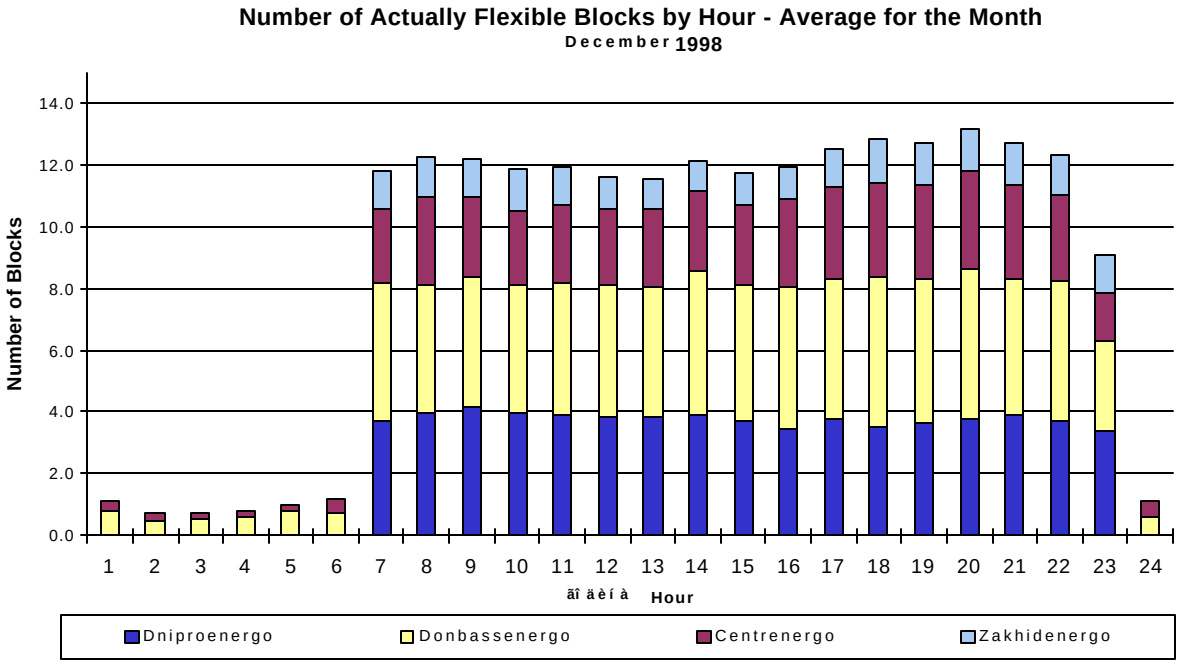


As an extension of the above information, the level of utilization of a generating company's capacity over time can also be presented. Below are the utilization levels for Dniproenergo's stations in December, which are extraordinarily low by any standards, particularly during the heart of winter:



2.2.3 Flexibility

The flexibility parameter for each block is important in that it determines whether a particular generation block is capable of setting the SMP. Depending on the fuel type, a block is considered flexible if either if its operation can be stopped at the command of the dispatcher, or, during the hours of 7-23, if it is capable of adjusting its level of generation by at least a certain minimum percentage. Since only flexible blocks can set the SMP, the distribution of flexible blocks among the generators is an indicator of the degree of competition in the market. A Genco with all of the flexible blocks within a time period can exert market power and be free to bid higher prices into the market. While this was not a problem in December (as can be seen below) the situation did arise in summer months when all flexible blocks were from only one or two gencos.



2.2.4 Thermal Generator Block Bids

The data files available from Energomarket include information regarding the bids submitted by the four thermal generators. The bids determine the SMP and the merit order ranking of Genco blocks. These bids are submitted to NDC a day before the scheduled generation day, for the Block Start Up Cost, block no load cost, and price bids for two to four possible generation levels (elbow points). NDC determines the merit order of the blocks submitted by all the gencos and on the basis of the needed demand determines the blocks to be dispatched. The SMP is determined by the most expensive flexible block to still fall among the dispatched units in any hour.

While gencos are supposed to bid on the basis of their costs, they need to be aware of where their bids fall in relation to the other gencos'. If they bid too high, there is a chance that they will not be selected to run, and they will lose potential revenues. If they bid too low, wanting to ensure that they will run, and happen to set the marginal price then they would have to operate at a loss.

Two years ago Hagler Bailly developed a Market Simulation Model for the thermal gencos, which approximated the workings of the Energomarket ranking and dispatch decisions. Using this model, generators could get a feel for the impact of submitting different bids for their various blocks and by

running market simulations with different input parameters and analyzing the resulting dispatch and generation instructions.

An estimate of the bid calculations for the four thermal gencos for the first fifteen days of December is offered in the tables in Appendix A. The tables shows a price equal to the sum of: (1) the incremental price at the highest elbow point and (2) the Block No Load (BNL) price divided by the quantity bid at the highest elbow point. According to the Wholesale Market Rules, during the 7 off-peak hours, each block's price for computation of the SMP simply equals the incremental price bid at this point. During the 17 peak/shoulder hours, however, each block's price equals the sum of:

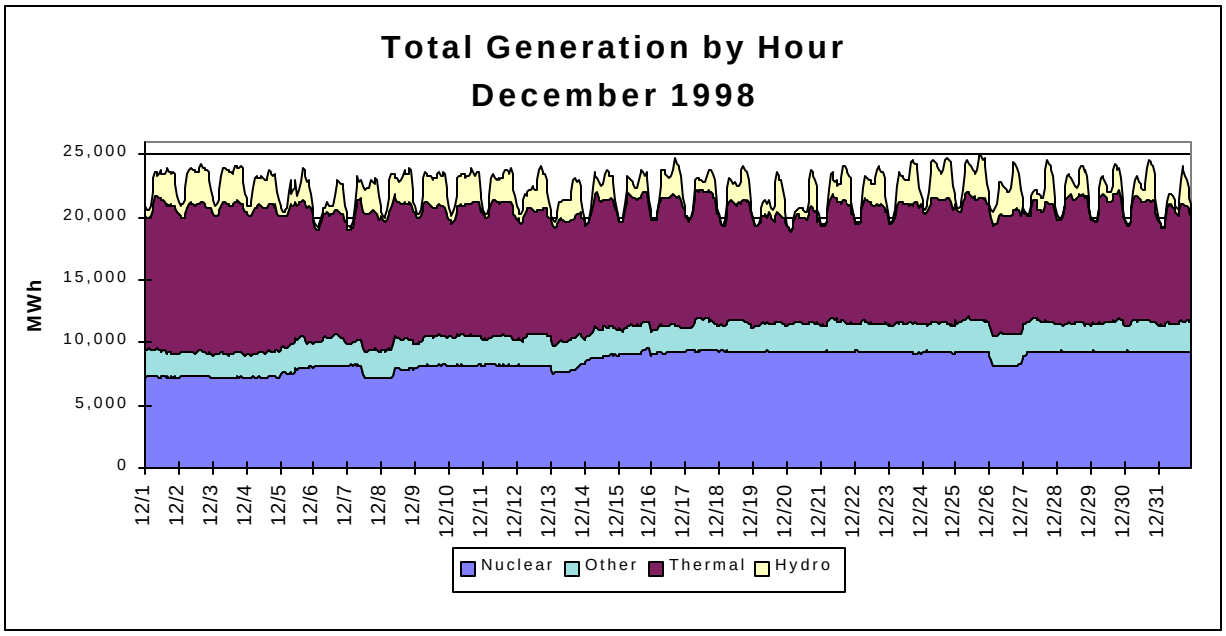
(1) the incremental price plus
(2) the quotient of:
    (a) the sum of
        (i) the BNL price times 24 divided by 17 plus
        (ii) the startup costs times the number of start-ups by the block (in practice generally zero, sometimes 1 and never 2 or more)
    (b) divided by the block's generation over all 24 hours of the day

Therefore, the price in the table is a good proxy for the average price over the day at the highest elbow point for blocks which do not start-up during the day.

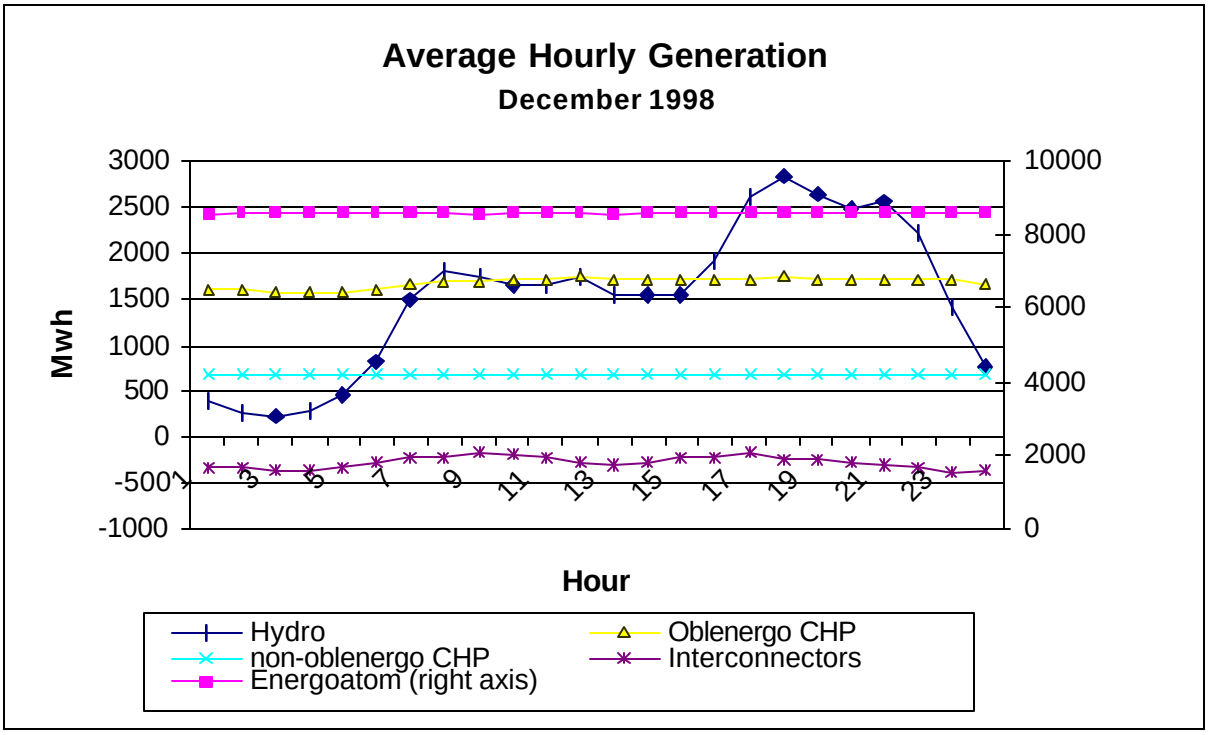
2.2.5 Nuclear / Hydro / CHP / Interconnectors

Generation information for nuclear plant, hydro units, independent CHP generators and interconnectors, and the payments due them are also reported within the Systems settlement files on an hourly basis. All generation other than the four fossil gencos have their prices set administratively by NERC. (the Gencos, since November have also had their prices administratively set). A composite graph of all generation in Ukraine for the month of December is offered as the first of two graphs below. There it can be seen that nuclear makes up the baseload, with much of the rest of the demand being made up by the fossil gencos.

The second graph shows the average hourly generation for the non-thermal generation. Nuclear generation is shown on a separate axis, as it dominates all of the other non-Genco type generation. Here it can be seen that Hydro generation and to a much lesser extent, interconnectors are the only ones that fluctuates with time of day, as nuclear and CHP generation remains constant.

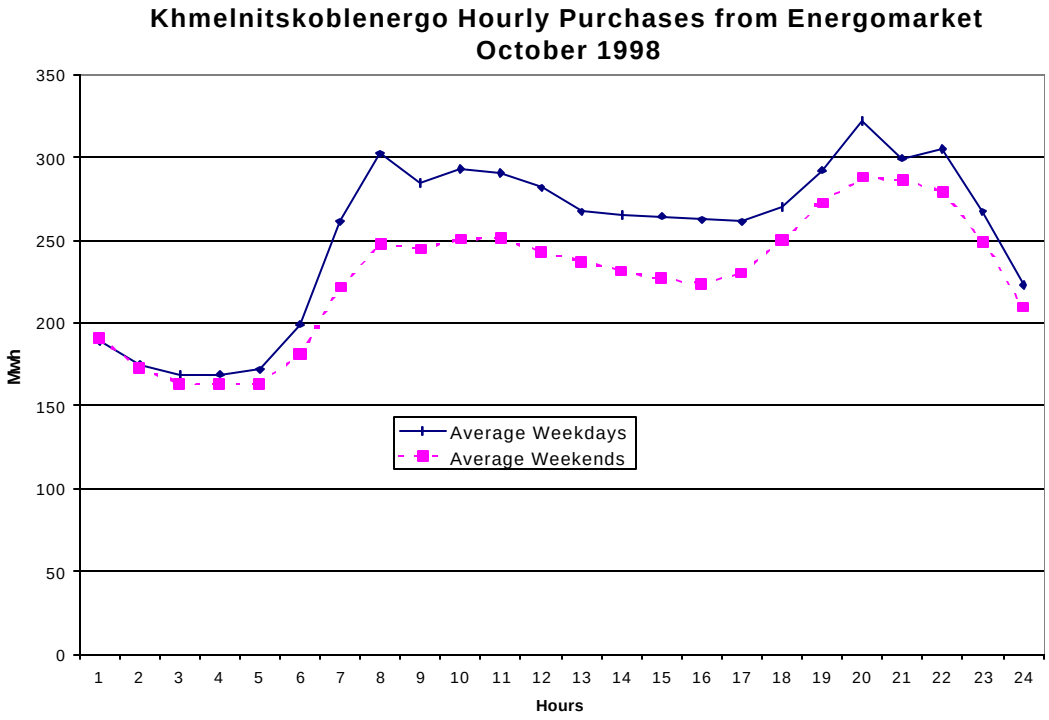


"Other" generation includes independent and Oblenergo CHPs and interconnectors.



2.2.6 Oblenergos

Data was at one time available regarding hourly purchases by oblenergos from the market, both in Mwh and in terms of payment due under the market rules. From this data, load curves can be determined for particular days of the week or averages for the month and with the exception of oblenergos with their own generation units (CHP or hydro), these curves would represent their full purchase of electricity before low-voltage distribution, and losses. Similar data was available for Independent Energy Suppliers. Since November, however, NDC has decided that such data should be "confidential" and did not make it available in the files. An example of a load curve for Khmelnitskoblenergo in October is offered below:



CHAPTER 3
MARKET FUNDS PROCEDURE

3.1 GENERAL

In order for potential investors to understand how cash collected from customers is distributed among the generators, oblenergos and other market members, they must become familiar with the Market Funds Procedure (MFP).

The MFP, which provides guidelines for the regular financial transactions of the wholesale electricity market, forms an integral part of the Wholesale Market Members Agreement. It is found as its own appendix to the Agreement (as Schedule 4), and states among its principles and objectives:

< to serve as "the set of Agreed Procedures which govern funds transfers between Market Members under the Wholesale electricity market Arrangements and how transfers are accounted for and reported by the Energomarket State Enterprise."

< "to provide a clear, transparent system by which payments and receipts under the Wholesale Electricity Market are made and recorded."

< "ensures that it is possible to calculate, on a daily basis, receipts from and payments to all Market Members, together with a balance for the amounts owed to the Wholesale Electricity Market by Suppliers and the amounts owed by the Energomarket State Enterprise to other market entities."

The specific implementation of this directive is decided by the Energomarket Board, although both NERC and Minenergo have issued Resolutions regarding its operation. A special Market Funds Administration is set up within Energomarket (with appropriate resources and staff) with the responsibility for executing the MFP.

3.2 HISTORY OF THE MARKET FUNDS PROCUDURE

In light of the very low state of cash collections, a special interim Market Funds procedure was implemented in March of 1997, as way to allocate the low levels of cash that trickled into the transit

accounts of the Oblenergos from electricity customers. All cash payments collected by the Oblenergos for electricity sold were required to be deposited into a special transit account set up for each Oblenergo in the bank of the Energomarket.

The original algorithm was designed to provide Oblenergos and Generators with financial incentives to collect cash rather than work through barter payments and was designed as a method to split the cash that flowed into the system each day. It was not intended to serve as a comprehensive accounting tool. Given the scarcity of cash and its desirability relative to barter deals, market members became quickly aware of the importance of the specific details of the Market Funds algorithm. However, the algorithm has not succeeded in raising cash collections. The algorithm is generally described below:

Regarding Oblenergos:

- LECs incur expenses in providing the electricity they sell, as reflected in their low voltage transmission (LVNO) and supply (RTS) fees. Through the algorithm, they were compensated for this according to their own individual cash collection rates. This rate was defined as the collected cash that flowed into the transit account for a particular day of sales divided by the collection target for the day (equal to the weighted average retail tariff times total LEC sales in MWh).
- To discourage excessive use of offsets, a portion of the payments LECs received in the form of offsets was subtracted from the cash amount they were due back for their LVNO and RTS expenses.
- Consequently, the more cash LECs collected, the more they would receive back from the market. And the more offsets they engaged in, the less cash they would receive.
- A problem arose in the days when LECs had offset amounts that were greater than the amount of cash due back to them. In these instances, LECs would not receive any cash for that day and a negative payment would be recorded for the LEC. These negative balances quickly accumulated, particularly for the heavy industrial regions engaging in heavy offsets (Luhansk, Donetsk, Dnipropetrovsk). Consequently, even if these oblenergos started collecting more cash, they would not realize it until they worked off their negative balances. Thus their incentives to collect cash were greatly reduced or eliminated.
- Oblenergos were *required* to transmit their cash collections for electricity into the transit account, of which they would see a small percentage, if any at all. Thus were also created strong incentives to collect money outside the system, because an oblenergo could retain all the cash it collected that did not go into the its transit account.

Regarding Generators:

< From the collected cash, Generators were paid proportionately to the level of payment that the Energomarket owed them for electricity sold to the market for that particular day. From their expected payments was subtracted a portion of Address Sales or Give and Take Sales for the for the day (similar to offsets/barter for the LECs). Thus if a genco engaged in offsets its cash payments were reduced by some part of the offset amount. Oblenergo generation (hydro and CHP) were compensated by this same method.

< Through the algorithm, other parties received fixed amounts or proportions of the cash. For instance Minnenergo received 4% of the cash received every day. Energoatom received 2% of the cash received every day (in addition to what it received as a generator), while Dniprohydroenergo received additional fixed payments for large repayments of a World Bank loan. All market entities contributed a portion of their cash due to pay off these third parties.

Algorithm Changes

The Energomarket Board decided as of March 1, 1998 to start implementing a new algorithm, reflecting a compromise between alternate approaches put forth by NDC and NERC, for the calculation of the MFP. This new methodology attempted to correct some of the problems of the old one. Among the major differences included:

Regarding Generators:

< The level of debt owed by Energormarket to the generators factors into the cash distribution among the generating entities. (The MFP includes Ukrenergo and the Wind Fund as generators for cash distribution purposes). For each settlement day, 1/45 of the debt owed by the market to a generator is added to the payments due for the generators sales to the market in that day to determine a total amount due the generator (on the basis of which cash will be distributed). In almost all cases, this debt divided by 45 is greater than the daily operations amount, meaning that this debt level will play a larger role in determining cash distributions than will daily operations. As a result, companies with high debt levels relative to their daily operations receive relatively more cash, while companies with lower ratios of debt to daily operations ratios receive relatively less cash

< The average daily total payments for a generator (cash + offsets + transfer orders, etc.) for the prior month will be subtracted from the daily payments due and the debt amount / 45 to come up with the total payments due for each generator in a day. This mechanism was designed to discourage generators' receipt of payment via offsets. Thus if a generator received large offset

payments in the previous month its total payments due for a day in the current month is substantially decreased.

< Cash is thus distributed to the gencos proportionately to their total payments due, which is calculated by:

Total Payments Due =

Payment for generation in the day + (Debt / 45) - Average Daily Payment for Previous Month

Regarding oblenergos:

< Oblenergos as a whole are paid off before cash is allocated for third parties such as Minenergo and the World Bank.

< Oblenergos receive the cash payments due them in proportion to their cash collection rates for that day. Oblenergo's debt levels to the Energomarket are not factored into this distribution calculation. The spreadsheet contains a column for the inclusion of oblenergo debt, but the column is never filled in. The accumulated negative cash balances held by the large industrial oblenergos were also eliminated, allowing them to receive cash from the market and hopefully providing them greater incentive to collect cash.

< Cash for Olbenergo generation (CHP and hydro) is distributed to oblenergos according to each olbenergo's cash collection rate - not at the generally lower generation rates - benefitting oblenergos with generation and high collection rates.

< Cash due to an oblenergo equals:

$$\text{Cash} \times \frac{\text{Weighted Average LVNO fee} + \text{Weighted Average Supply fee}}{\text{Weighted Average Retail Tariff}}$$

< NERC calculateds the Weighted Average LVNO fee and the the Weighted Average Supply Fee in the numerator and the Weighted Average Retail Tariff in the denominator. These calculations, however, are not made public

Subsequent to this March, 1998 revision, additional changes were made in the Market Funds Procedure method of reallocating cash back to the oblenergos for their generation, transmission and supply fees. The Joint Minenergo/NERC Resolution 1152 dated 8 September attempted to increase cash payments through the clearing accounts. It required oblenergos to pass at least 30% of the value of electricity purchased from the wholesale market into the clearing accounts in order to receive a

distribution of market funds, and required that 50% of funds received for reactive power be flowed through the clearing account. This resolution went into effect as of the September 9th payment day (or August 24th schedule day).[1]

This resolution would result in less cash passed out to the Oblenergos and thus leave more for the generating companies. However, Oblenergo fees (for generation, low voltage transmission and Supply) generally account for only about 15% of the daily collection target from consumers. Since oblenergos had been collecting about 10% of the target in cash, and are paid cash according to their collection rate, the cash going to them would be *at most*, only 1.5% of the daily target. Thus large increases in cash to generators could not be expected from the procedure, even if none of the oblenergos met the threshold - unless there were an accompanying increase in general cash collections.

The above Resolution was altered on October 2 with the issuance of Resolution 1284 and Resolution 1285. Resolution 1285 placed each of the oblenergos into one of four payment categories based on historical collection rates. Resolution 1284 specifies, for each of the four groups, a collection rate band (e.g. Group 1 band is 30-40%, Group 2 is 22.5-30%). If the oblenergo collection rate falls within the band limits, then cash payments are distributed according to the Market Funds Procedure. If the collection rate falls below the lower limit the oblenergo is penalized and it is rewarded for exceeding the upper band. An excerpt from the Resolution is provided:

[1] The distinction between schedule and payment day is explained in section 3.3.1.

2.1. For electricity distribution companies of Group I:

2.1.1 provided that payment for the electricity purchased in the WEMU to the clearing account of NEC Ukrenergo is within 25%-30%, according to MFP;

2.1.2 provided that payment for the electricity purchased in the WEMU to the clearing account of NEC Ukrenergo is more than 30%, according to MFP, taking into account the increasing factor which is calculated by the following formula:

$$C_3 = \frac{1.2 * (\%\ of\ payment)}{30\ \%}$$

2.1.3 provided that payment for the electricity purchased in the WEMU to the clearing account of NEC Ukrenergo is less than 25%, according to MFP, taking into account the decreasing factor which is calculated by the following formula:

$$C_n = \frac{\%\ of\ payment}{25\ \%}$$

This resolution came into effect as of the October 5th payment day, or correspondingly starting with the September 17-19 schedule date and in December was extended to remain in effect though May. The effect of the second resolution limits even this small potential increase of cash to the generating companies, as oblenergos are much more likely to receive cash under the new resolution. Oblenergos can potentially even receive more cash than they would have under the old MFP, if they supercede the higher bound.

Since the issuance of these Resolutions, the band-widths have been modified once and the grouping of the Oblenergos have been changed twice, once for November and once for December.

3.3 ENERGOMARKET MARKET FUNDS PROCEDURE DATA

3.3.1 Data format

For each day, the Market Funds Administration issues a set of files in Excel format, summarizing the cash collected by the oblenergos and its redistribution among all market entities.

The cash collections and sales data are for two different days. The dates reported are for the "schedule day", which is the day the electricity was generated and consumed. The cash collections reported for that date was actually collected 15 days after that date. For example, July 12 data represents physical data for July 12 but cash collections from July 27. The reason for the difference is that it takes NDC 16 days to process the physical operations data, but only one day to process the cash collections. Therefore, the physical data and cash data are not and should not be for the same day. This asynchronous procedure does not raise any problems, however, because the logic of the MFP is that oblenergos receive cash according to the ratio of their collections to their sales, and generating companies according to the ratio of cash available to their sales, and over time sales tend to be fairly even, especially for oblenergos.

Since the MFP reports collections and transfers of cash among the clearing and settlement accounts of the market entities (within Promivenstbank – the market banker), the files describing these transactions are created during banking days. Thus, data for weekends and holidays are consolidated into files with other days.

There are essentially four different Excel files generated for each day. For example for January 30th the four files would be:

Ukf30.xls
Ukf30nv1.xls
Ukf30n.xls
Ukr3001.xls

Of these the Ukr3001.xls is by far the largest and most comprehensive file, while the other files are smaller subsets of this same information, either summarized for the month, or according to payment day rather than settlement day. Within the sheet titled "ðîçðàõóíîê" in the Ukf3001 file, the cash distribution algorithm is fully outlined, column by column for both the oblenergos and the generators (with heading and titles in Ukrainian). Thus the final cash allocation to the market participants can be traced from all of its algorithm components for each banking day.

Data from the Market Funds Procedure is attributed to entities selling electricity to the market. In some instances, generating companies have leased generation blocks to other firms, (eg. Stirol at Vuhlehirk, Integrazia at Ladyzhin) and thus the generation that is produced by these blocks is sold to the market as though it were generated by those entities. Although the electricity is produced using the Genco's

equipment, the algorithm treats the companies leasing the blocks as separate entities, with their own calculated levels of debts, previous month's payments, etc. The cash and/or payments received by the Gencos for such rentals are not considered in the MFP. (Additionally, it is not entirely clear how electricity exported by Zahkidenergo is accounted for within the Procedure or within the Systems Setllement Procedures.)

3.3.2 Generator information for investors:

Given the wealth of information found within the Market Funds Procedure, it is useful to separate out some key indicators and parameters which might be of most interest to potential investors in Generating companies. Charts and tables regarding Genco information are offered in Appendix B. The specific types of information summarized below will pertain to:

< Cash received by generators from the Energomarket
< Cash allocation underlying algorithm
< Total Generation sales, prices

Cash Received from Energomarket

The MFP shows the amount of cash allocated to the generating companies. This cash flow directly affects the Genco's ability to conduct their business operations. Were the gencos to receive sufficient cash, they could use it to buy fuel, pay salaries, undertake maintenance, capital renovation, or consider new investment. However, as it is, all of the gencos' available cash seems to go to paying taxes and salaries and the salary payment are usually late. The included chart entitled "Daily Amount of Actual Payment (Gencos)" shows the daily flow of cash (in Hryvnia) into the settlement accounts of the gencos for the months of November and December. The accompanying table offers numerical data on cash received for all of the generating entities (nuclear, hydro, CHP, interconnectors, rental units) for the first fifteen days of this time period.

The chart "Actual Payment Percentage (Gencos) illustrates the cash collected for a particular day as percentage of the amount due the Genco for its output on that day. The accompanying table offers the corresponding numerical data for all of the generating entities (nuclear, hydro, CHP, interconnectors, rental units) for the first fifteen days of this time period.

Cash Allocation Information

Given the structure of the algorithm, there are a number of payment and financial variables that help determine the final cash payments to generating entities that may be of interest to potential investors in generating companies. A number of these variables are summarized in the table "Cash Allocations to Generating Companies and NDC" which is included for the month of December. This data has been compiled from a full month of MFP files (19 files). Of course, data on an individual day's (or blocks of days for holidays and weekends) sales and cash collected can also be compiled.

While the average daily cash received by the generator from the market (column 5) is the key resulting piece of data, understanding of the other variables allows for an underlying explanation of this allocation according to the algorithm. The columns of the table show:

- (1) the absolute amounts of average daily obligations by the market to each entity – this represents the daily average over the month of the quantity of electricity sold to the market times the price.

- (2) the debt to the entity used in the MFP - this equals total debt as of the 1st day of the prior month divided by 45 in most cases. It is important to note that there are a number of exceptions to the rule, and that these can often change in the course of a month. For instance, in December, the debt was divided:
  - by 40 for Dniesterhydroenergo (which was lowered from 45 in mid November)
  - by 30 in the case of Ukrenergo (formerly NDC),
  - by 25 in the case of Pravex,
  - by 15 in the case of the Zuev Experimental TEZ,
  - by 10 for Dniprohydroenergo.

- (3) the average payments of all kinds, including cash and offsets, to the entity from Energomarket in the prior month (equal to the prior month's payments divided by the number of days in the current month),

- (4) the average net amount owed to the entity for each day (equal to column 1 plus column 2 minus column 3), and

- (5) the average amount of cash paid to the entity for each day for the month. This represents the actual amount of cash that the entities receive from the Energomarket.

Columns 6 through 9 offer several ratios which shed light as to primary determinants of the level of the generators cash distribution. These can be useful when compared to the ratios of other generators.

- (6) the average amount owed to the entity for each day of actual operations (column 1) as a percentage of the average algorithm amount owed to the entity (column 4);

- (7) the algorithm debt amount as a percentage of the daily amount owed (the higher the number in column 7, the *greater* the cash payment compared to the amount owed for the day's operations);

- (8) the prior month's payments as a percentage of the daily amount owed (the higher the number in column 8, the *lower* the cash payment compared to the amount owed for the day's operations).

- (9) shows the cash payout percentage, which is equal to the average payout in cash to the entity for the month (column 5) divided by the average amount owed to the entity for daily operations (column 1).

- (10) and (11) show the cash payout percentage for the previous months, for the sake of comparison.

The table shows widely disparate cash payout percentages for different entities as well as changes from previous months. Close inspection of any entity's data reveals the reason for its payout percentage. Note the following:

- For December, generating companies received slightly less than 3% of their payments in cash, down from 4.7% in November, 4.9% in October and 6.4% in September.

- The overall level of debt used for the calculation of the payout continued to increase from November to December. This essentially, means that debt owed to generators is increasingly becoming the key factor in the determination of cash distribution to generators, while payments for their operations in the current month are playing less of a role.

- Of the four fossil generating companies the debt percentages of Zakhidenergo and Dniproenergo remained higher than the other companies' relative to their daily

generation, and accordingly Zakhidenergo and Dniproenergo continued to receive slightly higher cash payout percentages in December.

- ☼ Ukrenergo received payout percentages far higher than the average. This was because of its high debt percentage (debt owed it divided by the average daily operational amount owed, i.e., the ratio of algorithm debt to the amount owed for the day's operations). Likewise, Dniprohydrenergo's debt is inflated in the daily calculations, which results in their very high payout percentage, particularly influenced by the fact that Dniprohydrenenergo's actual debt is only divided by 10 for determination of cash allocation, rather than by 45, as are most of the other generators. The generators Bilotsekivska TEZ, Energoresurs, and ZAT Stal received a high payout percentage in December, as they all severely cut back production.

Daily generation, Prices

Also available through the MFP is data on generation and prices, which is taken from and duplicated in the Systems Settlements Procedures. Rather than on an hourly basis, this data is presented for a full day (or days in the case of holidays or weekends). This data differs from that in the systems settlement files in that it treats rental blocks and specific interconnector operators separately. Tables entitled "Electricity Sold to the Market" (four sheets), and (Payments)"Owed to Gencos" (four sheets) show this data for the individual market entities over the course of November and December. From these components, one can easily construct the table entitled "Average Price of Electricity Sold to the Market" (four sheets). Observations from the data provided in these charts and tables include:

- < Starting on the 10th of November, the average price that should have been paid to thermal generators rose significantly, from a level of around 110-115 hryvnia per MWh up to 140 hryvnia per MWh by November 17th. This can be seen in the enclosed Chart and Table entitled "Average Price of Electricity Sold to the Market (Gencos and Energoatom)". The prices for December generally ranged between 120-130 hryvnia per MWh. Information on hourly generation and prices is not available through the MFP, but can be found within the System Settlement data sets.
- < With the start of December, there were shifts among the generation sold to the market by the smaller generators, particularly the interconnectors. Ukr-Can Power stopped selling generation into the market as of November 29th while ZAT Stal and Energresurs severely cut back their sales in December. RosUkrenergo began selling again on December 16th for the first time since November 11th.

< The interconnector companies Energoresurs and InterKontakt had a one to one correspondence in terms of electricity sold to the market for every day until November 11th, while Energobudservis's sales to the market stayed at a level one half of Energoresurs's level for every day through November 18th. Promenergokomplex's sales were also proportional to those of Enenrgobudservis, at 1.63 times their size. The prices paid to these companies for their electricity were also generally equal, although not at all constant over the course of the month, as one would expect from interconnectors.

3.3.3 Oblenergo information for investors:

With the information found within the Market Funds Procedure, it is similarly useful to separate out some key indicators and parameters which might be of most interest to potential investors in the distribution companies / Oblenergos. Charts and tables pertaining to oblenergo information are found in Appendix C. The specific types of information summarized below will pertain to:

< Oblenergo Total Sales / Collection Target
< Collection Bands (set by NERC/Minenergo)
< Collection Groups (set by NERC/Minenergo)
< Cash collection rates
< Cash returning to Oblenergo (also LVNO, Supply, Generation Tariffs (set by NERC)

Total Electricity Sales / Collection target

A figure called the "general consumption level" within the Market Funds Procedure indicates the total amount of electricity acquired by an oblenergo for distribution (whether it be from the Energomarket or from its own generation). This figure is multiplied by what is set as the "weighted average retail tariff" to come up with the "collection target" that the oblenergo should collect into its transit account for its procured electricity. This indicator for each of the oblenergos for the months of November and December is included in the table marked "collection target". These figures give an indication of the amount Oblenergos pay for the electricity they need to satisfy their demand.

The weighted average retail tariff calculation is prepared by NERC. NERC's calculations are not made public. Therefore, NERC can and does reward or punish oblenergos in arbitrary ways. Weighted average retail tariffs have changed over time for various oblenergos based on NERC's desires.

Collection Bands

As of the Joint Minenergo/NERC Resolution 1438, of November 12, 1998, the collection rate bands for the different oblenergo groups were modified and were thus in effect for November and December. These collection bands, as described earlier in this chapter, are part of the algorithm that determines the amount of cash that is to be returned to the oblenergos by the Energomarket. The lowered band widths serve to allocate the oblenergos more cash, as they are more likely to achieve their collection band, or at least will be penalized less. The specific band limits in effect are offered in the table below:

Group	Old Collection Bands	New Collection Bands
I	30% - 40%	25% - 30%
II	22.5% - 30%	20% - 25%
III	15% - 22.5%	15% - 20%
IV	10% - 15%	10% - 15%

Collection Groups

As described in an earlier section of this chapter, the amount of cash that is returned to each oblenergo by the market depends on its cash collections and on its collection group. As of the Joint Minenergo/NERC Resolution 1452 the oblenergos were reassigned to different collection groups for the month of November. However, the basis for this regrouping is unclear. It does *not* seem that the oblenergos were reassigned on the basis of their October performance. Zhytomyroblenergo, with 9.5% cash collections (as a percentage of its target) in October remained in the highest Group I band, while Kyivoblenergo, with a higher 15.3% cash collections rate in October, was dropped from Group I to Group II. Similarly, Kharkivoblenergo, with 6.7% cash collections in October (among the lowest among all oblenergos), was moved up two groups from the lowest group IV category to group II. In all, nine oblenergos changed groups from October to November.

In December, as during the previous months, the Market Funds Administrator determined each day whether an oblenergo has attained its cash requirements. Depending on this determination the cash amount due back to an oblenergo was calculated. However, for this procedure another indicator,

different from the usual cash collections rate, is used. According to the joint NERC/Minenergo resolution, cash received back by oblenergos should depend on their cash payment rate for the electricity purchased from the market (not total cash collected which partly includes payment for low voltage transmission and supply relative to the collection target). The Market Funds Administrator, in an attempt to strictly follow this resolution, introduced a couple of new columns to the algorithm, where running totals of monthly electricity purchases from the market and the cash payment for it were presented. The basic indicator determining compliance with the bandwidths is obtained by dividing the latter by the former.

Instead of net cash payments for the purchased electricity, however, the cash column uses total cash receipt to the clearing account. As to the running total of electricity purchases, the algorithm, in general followed the real numbers, but for some reasons, in payment days with multiple schedule days, only the daily average for those days were added to the aggregated amount. Thus, the amount of electricity purchases used in the algorithm for the group criterion purpose actually differed from what is should been. In calculating the oblenergos' running cash collection rate, the MFA used an increased numerator and lowered denominator. Thus, the compliance indicators were greater than they should have been.

It should also be noted that the Oblenergos collection rate indicator used to determine whether they meet the threshold levels is calculated on the basis of the totals for the calendar month. Thus on November 1, and December 1, the totals were cleared and started anew. Such a discontinuity in the calculation of the collection ratio might encourage the front loading of oblenergo cash collection efforts to the beginning of the month. It likewise discourages attempts at collecting more cash at the end of the month, as its impact on cash returning to the oblenergo would be minimal

As of the NERC's Resolution 1612, from December 15th the following oblenergos were reassigned to different collection groups for the month of December as noted below:

Oblenergo	*November group*	*December Group*
Ternopiloblenergo	3	2
Cherkassyoblenergo	2	3
Chernihivoblenergo	2	3
Lvivoblenergo	3	2
Kharkivoblenergo	2	3

Oblenergo	*November group*	*December Group*
Poltavaoblenergo	1	2
Rozdil ZhKU	2	3

Once again, the basis for this reassignment is unclear, as Chernihivoblenergo, Rozdil ZhKU and Cherkassyoblenergo actually experienced increases in their collection rates relative to their target from October to November and were all dropped to lower collection bands. The effect of these frequent unexplained changes in grouping is to reduce oblenergos' incentives to collect cash. In additions, it illustrates the arbitrary nature of regulation in Ukraine. NERC can and does punish or reward an oblenergo without any explanation to the public.

The methodology used in determining the groupings of oblenergos should be made transparent and available to the public as keeping the basis for these decisions hidden adds another large degree of non-transparency for any potential investors. The level of cash flowing to the oblenergos from the Market in essence becomes dependent on regular decisions by Minenergo and NERC. As noted earlier, frequent changes in the categories also undermine the whole principle of establishing clear incentives to oblenergos to improve their cash collections. Constant changes to the collection bands, rewards and penalties, would discourage serious, concerted, longer-term efforts by the oblenergos to attain and improve collection targets.

The oblenergo groupings for December are offered below:

GROUP 1	**GROUP 2**	**GROUP 3**	**GROUP 3**
Chernivtsioblenergo	Poltavaoblenergo	Novorozdilsk	Luhanskoblenergo
Zhytomyroblenergo	Zakarpattiaoblenergo	Kharkivoblenergo	Donetskoblenero
Vinnytsiaoblenergo	Khersonoblenergo	Chernihivoblenergo	Dniprooblenergo
Volynoblenergo	Kyivoblenergo	Cherkassyoblenergo	Zaporizhzhiaoblenergo
Khmelnytskoblenergo	Krymenergo	PEM – Energovuhillia	
Donetskvyhillia	Sevastopolmiskenergo	Mykolaivoblenergo	

	Ternopiloblenergo	Prykarpattiaoblenergo	
	Lvivoblenergo	Odessaoblenergo	
		Kirovogradoblenergo	
		Rivneoblenergo	
		Sumyoblenergo	

NERC Resolution 12-/338/1, issued on March 18th, 1999 effectively terminated the use of rate-bands and oblenergo collection group categories as of March 18th. Thus, the process of cash distribution amongst the oblenergos resumed operating according to the algorithm that was in place back in August of 1998.

Cash Collection Rates

Total cash collections by the individual oblenergos for November and December (in Hryvnia) are shown in the table entitled "Total Collections". The Cash Collection Rate (defined as a percentage of the collection target) for November and December is included in the similarly named table. This rate declined sharply, particularly in December, as the total amount of electricity sold (and thus the collection target) increased with the colder weather. There is a relatively larger drop in collections after December 15 (meaning after the New Year in terms of payment days).

A chart listing the oblenergos, and their cash collection rates over November and December is enclosed under the title "Cash Collection Rate Compared to the previous Month". This allows a comparison of the collections performance of the different distribution entities. The oblenergos are arranged according to their November NERC grouping. A line representing the percentage drop in the cash collection rate from the previous month is also offered in the chart, where it can be seen that all of the entities experience a decline in collections from November to December.

The enclosed charts entitled "Cash Collection Rate Compared to Weighted Average" show cash collection rates for oblenergos organized according to their groups - allowing for performance comparisons within the groups. Separate charts are provided for November and December. The wide variance within each group once again leads to uncertainty as to the grouping methodology.

Cash Returned to Oblenergos

Probably one of the key indicators of interest to potential investors regarding oblenergos that can be collected via the MFP is the actual amount of cash that is returned to the settlement account of the oblenergos.

Cash that Oblenergos obtain from the Market is shown on the Table entitled "Payments Due from Clearing Account to Suppliers's Settlement Account" found at the end of this section. With the drop in collections in December significantly less cash was left with the Oblenergos in December. The specific amounts of cash collected by indvidual oblenergos for each day is offered in the table.

Such cash from the market is one of the primary sources of an oblenergo's cash flow and working capital in general (to the extent that the oblenergos fully follow the directive that all cash payments for electricity from customers for electricity are to be paid into the clearing accounts). Following the rules, the only other potential source of cash for oblenergos directly relating to their work as electricity distribution companies would be payments received for transit of electricity for IES's and penalties and fees collected from customers.

CHAPTER 4
CONCLUSIONS

The data presented within this report represents only a selected portion of the total information found within the daily data files generated by the Energomarket System Setttlements and Market Funds Administration. There may very well be additional data within these files of interest to potential investors in the power sector of Ukraine.
The data presented within this report can serve as a starting point however, for investors seeking to understand the workings of the market, the setting of prices, and the performance of individual generators and oblenergos.

Generation of the detailed tables and graphs of the type found within this report has largely been automated. Macros and programs have been developed to cull the relevant information from the Energomarket source files and present it in a more useful format for analysis. Continuing and refining these procedures would be straightforward.

It is hoped that with the availability and regular reporting of such data from Energomarket itself, investors would appropriately value the additional transparency of the market, and be better equipped and more inclined to make positive investment decisions in Ukraine's power sector.

APPENDIX A
SYSTEMS SETTLEMENTS - BIDDING DATA FOR DECEMBER

APPENDIX B
MARKET FUNDS PROCEDURE – GENERATOR INFORMATION

APPENDIX C
MARKET FUNDS PROCEDURE – OBLENERGO INFORMATION